

ROOFING MATERIALS HAVING ENGINEERED COATINGS

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TECHNICAL FIELD AND INDUSTRIAL APPLICABILITY OF THE INVENTION

The present invention relates generally to asphalt-based roofing materials,
10 and more particularly to asphalt-based roofing materials having coatings which
are engineered to vary in composition through the thickness of the roofing
materials. The invention also relates to processes for coating the roofing
materials.

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BACKGROUND OF THE INVENTION

Asphalt-based roofing materials, such as roofing shingles, roll roofing and
built-up roofing, are installed on the roofs of buildings to provide protection
from the elements. Typically, the roofing material is constructed of materials
including an inner mat such as a glass fiber mat, an asphalt-based coating which
20 saturates the mat and coats the top and bottom, and a layer of granules embedded
in the top coating. The coating usually contains a filler such as ground
limestone. Roofing shingles usually have a backdust material such as silica sand
on the bottom coating to prevent them from sticking together in a bundle.

The quantity and composition of the materials used to make a roofing
25 material determine, to a great extent, the performance of the resultant roofing
material (e.g., weathering, cracking, blistering, algae resistance, pliability,
sticking, and impact resistance). They also determine the cost to produce the
roofing material. For a roofing shingle, the cost to produce the shingle is usually
about 60-80% materials cost.

Current commercial roofing materials are typically produced with the same asphalt and filler throughout (top coating, mat saturant coating, and bottom coating). Thus, each material in the coating must meet more performance criteria than if different materials could be used in the different portions of the coating. This leads to compromises, typically between cost and performance, but sometimes between one performance parameter and another.

Some patents disclose roofing materials made with varied coating compositions. For example, U.S. Patent No. 4,405,680 to Hansen discloses a roofing shingle including a mat saturated with a mixture of unblown asphalt and polymer, and coated with a mixture of a blown asphalt and filler.

U.S. Patent No. 4,848,057 to MacDonald et al. discloses a roofing shingle including a mat saturated with asphalt, coated with a rubber-modified asphalt on portions prone to cracking and a coating asphalt on other portions, and further coated over all portions with the coating asphalt.

U.S. Patent No. 5,488,807 to Terrenzio et al. discloses a roofing shingle including a mat saturated with asphalt, coated with a first coating asphalt, and further coated with a second coating asphalt on portions of the shingle. The second coating asphalt has greater elongation or extensibility than the first, for example by modifying the asphalt with a polymer and a plasticizer.

U.S. Patent No. 6,120,838 to Zickell discloses a roofing shingle including a mat saturated and coated with a mixture of flux asphalt and recycled roofing material, and further coated with a polymer-modified asphalt.

In view of the current commercial roofing materials and those disclosed in the patents, there is still a need for roofing materials having coatings that are optimized as a whole for both performance and cost. There is also a need for a process for coating such roofing materials.

SUMMARY OF THE INVENTION

The above objects as well as others not specifically enumerated are achieved by an asphalt-based roofing material according to the invention, and by a process according to the invention for coating the roofing material. In one
5 embodiment, the roofing material comprises a mat saturated and coated with an asphalt-based coating. The coating includes a top portion covering the top of the mat, a mat portion saturating the mat, and a bottom portion covering the bottom of the mat. The top portion of the coating comprises a mixture of asphalt and rock particles which are igneous rock particles, metamorphic rock particles, or a
10 mixture thereof. The mat portion of the coating comprises a mixture of asphalt and filler, the filler containing no more than about 10% igneous and/or metamorphic rock particles.

In another embodiment, the roofing material comprises a mat saturated and coated with an asphalt-based coating. The coating includes a top portion
15 covering the top of the mat, a mat portion saturating the mat, and a bottom portion covering the bottom of the mat. The top portion of the coating meets or exceeds a pliability standard described in CSA Standard A123.5-98. The bottom portion of the coating does not meet the pliability standard.

In another embodiment, the roofing material comprises a mat saturated
20 and coated with an asphalt-based coating. The coating includes a top portion covering the top of the mat, a mat portion saturating the mat, and a bottom portion covering the bottom of the mat. The top portion of the coating includes a top surface layer. At least the top surface layer of the top portion passes a weathering performance test as measured by at least 60 cycles-to-failure using
25 ASTM Method D4799. The bottom portion of the coating does not pass the weathering performance test.

In another embodiment, the roofing material comprises a mat saturated and coated with an asphalt-based coating. The coating includes a top portion